# Farmers' behaviour on mitigation and adaptation to climate change. A case study in Kenya

*Silvestre García de Jalón[1,*], Ana Iglesias[1], Andrew Barnes[2]*

(1) Department of Agricultural Economics and Social Sciences, Technical University of Madrid, Spain

(2) Land Economy and Environment Research Group, Scotland's Rural College (SRUC), Edinburgh, UK

(*) Corresponding author: silvestre.jalon@upm.es

**Keywords**: Behavioural barriers, Mitigation, Adaptation, Climate change, Farmers, Kenya

## Introduction

Farmers in Africa are facing climate change and challenging rural livelihoods while maintaining agricultural systems that are not resilient. By 2050 the mean estimates of production of key staple crops in Africa such as maize, sorghum, millet, groundnut, and cassava are expected to decrease by between 8 and 22 percent (Schlenker and Lobell 2010). In Kenya, although projections of rainfall do not show dramatic decreases, the distribution of impacts is clearly negative for most crops. As increases in temperature will lead to increases in evapotranspiration, a potential increase in rainfall in Kenya may not offset the expected increases in agricultural water needs (Herrero et al. 2010).

In order to respond to these present and future challenges, potential mitigation and adaptation options have been developed. However, implementation is not evident. In addition to their benefits in either mitigating or reducing the vulnerability of climate change effects, many of these options do not have economic costs and even provide economic benefits (e.g. savings in the consumption of energy or natural resources). Nevertheless, it is demonstrated that even when there are no biophysical, technological or economic constraints and despite their potential benefits from either the economic or environmental climate change point of view, not all farmers are willing to adopt these measures. This reflects the key role that behavioural barriers can play in the uptake of mitigation and adaptation measures.

## Gaps in the literature and aims of this study

In the traditional literature, barriers to mitigation and adaptation are typically constructed around different dimensions such as biophysical, economic and technological barriers. Thereby behavioural barriers usually are not considered relevant enough to decisively affect the uptake of mitigation and adaptation strategies (Adger et al., 2009; Jones and Boyd, 2011). However, there is emerging literature that clearly depicts the significant role that behavioural barriers play in the uptake of mitigation and adaptation options (Adger et al., 2009; Lorenzoni et al. 2007).

A large number of studies have devoted to explore public perception of climate change (e.g. Eurobarometer Survey on Climate Change, 2011) and support for mitigation and adaptation strategies (e.g. Lorenzoni et al. 2007). Recently particular attention have been paid to the determinants that influence the support of adaptation policies in developing countries (Silvestri et al 2012; Østergaard

Nielsen and Reenberg, 2010; Deressa et al. 2009) and mitigation policies in developed countries (Semenza el at. 2008; Stoll-Kleeman et al. 2001). However, there is a gap in the literature about the factors which determine an individual's likelihood of having behavioural barriers to mitigation and adaptation. This paper aims to cover this gap as well as to study the role that farmers' behavioural barriers play in the uptake of mitigation and adaptation options in Kenya.

**Research methods**

The methodological process used here integrates the implementation of three focus group discussions and a household survey of 133 farmers. The focus group discussions and the survey were conducted in villages of Makueni County (Southern Kenya). Whilst focus group discussions provide qualitative information for an exploratory understanding of the behavioural barriers to mitigation and adaptation the survey implementation provides quantitative data which allows us to analyze in detail the main determinants of the barriers.

The three focus groups included between six and twelve participants per group, one group of male-farmers, one of female-farmers, and one group of agricultural technical advisors. Conducting focus group discussions separately allowed us to compare the different views of climate change as well as the most important barriers to mitigation and adaptation.

The questionnaire aimed to gather information on farmers' climate change concern, perception of barriers to mitigation and adaptation, behavioural attitudes towards environment, economy, institutions and policy, and demographic characteristics. Responses to the questions were measured using statements and Likert scales from 1 to 5. Principal Component Analysis (PCA) with Varimax rotation was used to reduce the number of statements in components which represented independent behavioural barriers to the uptake of mitigation and adaptation. Subsequently the main determinants of these barriers were assessed by a logistic regression, where the binary dependent variables were the behavioural barriers and the independent variables were personal values (economic and environmental values) and demographic characteristics (gender, age, economic status, and farm characteristics).

**Results**

Results from the focus group discussions showed that although farmers were fairly aware about climate change effects they had not implemented many changes to avoid or reduce climate change impacts in the last years. Farmers stated that the most relevant barriers are a lack of water availability, economic constraints and access to market. However, agricultural advisors added different perspectives claiming that one of the main barriers is a lack of governance and institutional support to shift to other income generating activities.

Survey results suggested that farming experience, educational attainment and receiving climate information are key factors that determine the likelihood of displaying behavioural barriers or not. As the uptake of mitigation and adaptation options is affected by behavioural barriers, these key factors finally play a critical role in the adoption of mitigation and adaptation.

The PCA identified 7 different items that were considered behavioural barriers to mitigation and adaptation. The identified behavioural barriers were climate change scepticism; lack of concern; fatalism and helplessness; externalising responsibility; blaming lack of adequate policies; reluctance to change agricultural practices; lack of knowledge to adopt changes.

**Discussion**

Some of the identified behavioural barriers were only barriers to either adaptation or mitigation. However, most of the listed barriers can hinder, reduce or avoid at the same time the uptake of mitigation and adaptation strategies. Moreover whilst mitigation seemed to be more influenced by individuals' environmental commitment, adaptation was considerably more affected by economic values.

The success of the climate change policies greatly depends on the extent of societal adoption of the strategies. Hence policy makers need to address the barriers that can inhibit or hinder their potential adoption. However, modelling frameworks for predicting policy development sometimes fail because of a lack of available data about behavioural attitudes and public support for policies. Thus the incorporation of behavioural constraints into the modelling frameworks allows us to obtain a more accurate estimate of the adoption extent. Consequently a better understanding of the behavioural barriers as well as their main determinants is crucial in order to increase the adoption of mitigation and adaptation strategies.

**References**

Adger WN, Dessai S, Goulden M, Hulme M, Lorenzoni I, Nelson DR, Naess LO, Wolf J, Wreford A (2009) Are there social limits to adaptation to climate change? Climatic Change 93, 335–354

Deressa TT, Hassan RM, Ringler C, Alemu T, Yesuf M (2009) Determinants of farmers' choice of adaptation methods to climate change in the Nile Basin of Ethiopia. Global Environmental Change 19, 248–255

Eurobarometer Surveys on Climate Change, 2011. European's Attitudes Towards Climate Change. Available at: http://ec.europa.eu/public_opinion/archives/ebs/ebs_372_en.pdf

Herrero M, Ringler C, van de Steeg J, Thornton P, Zhu T, Bryan E, Omolo A, Koo J, Notenbaert A (2010) Climate variability and climate change and their impacts on Kenya's agricultural sector. Nairobi, Kenya. ILRI

Jones L, Boyd E (2011) Exploring social barriers to adaptation: Insights from Western Nepal. Global Environmental Change 21, 1262–1274

Lorenzoni I, Nicholson-Coleb S, Whitmarsh L (2007) Barriers perceived to engaging with climate change among the UK public and their policy implications. Global Environmental Change 17, 445–459

Østergaard Nielsen J, Reenberg A (2010) Cultural barriers to climate change adaptation: A case study from Northern Burkina Faso. Global Environmental Change 20, 142–152

Schlenker W, Lobell DB (2010) Robust negative impacts of climate change on African agriculture. Environ. Res. Lett. 5, 014010 (8pp)

Semenza JC, Hall DE, Wilson DJ, Bontempo BD, Sailor DJ, George LA (2008) Public Perception of Climate Change Voluntary Mitigation and Barriers to Behavior Change. Am J Prev Med 35 (5)

Silvestri S, Bryan E, Ringler C, Herrero M, Okoba B (2012) Climate change perception and adaptation of agro-pastoral communities in Kenya. Reg Environ Change 12, 791–802

Stoll-Kleemann S, O'Riordan T, Jaeger CC (2001) The psychology of denial concerning climate mitigation measures: evidence from Swiss focus groups. Global Environmental Change 11, 107-117

**Acknowledgements:** We acknowledge the financial support of the European Commission Animal Change project (contract no. KBBE-266018) (http://www.animalchange.eu/).